

WHAT IS CLAIMED IS:

1. An axle driving apparatus comprising:
  - a common housing;
  - a hydraulic pump receiving power from a prime mover, said hydraulic pump being contained in said housing;
  - a hydraulic motor fluidly connected with said hydraulic pump, said hydraulic motor being contained in said housing, wherein at least one of said hydraulic pump and said hydraulic motor is variable in displacement;
  - a capacity changing device for changing the capacity of said at least one of said hydraulic pump and said hydraulic motor;
  - an axle driven by said hydraulic motor, said axle being contained in said housing;
  - a hydraulic actuator for operating said capacity changing device, said hydraulic actuator having a driving part and a fixed part, said fixed part being fixed to said housing, said driving part operatively connected to said capacity changing device;
  - a control valve for hydraulically controlling said hydraulic actuator; and
  - a link mechanism supported by said housing for operating said control valve, said link mechanism operatively connected to a traveling control member provided on a vehicle.
2. The axle driving apparatus as set forth in claim 1, wherein said driving part of said hydraulic actuator is connected to said link mechanism for feedback thereof.
3. The axle driving apparatus as set forth in claim 1, further comprising:
  - a neutral returning means provided on said link mechanism, wherein said link mechanism is biased to its neutral position by said neutral returning means for returning said capacity changing device.

4. The axle driving apparatus as set forth in claim 1, said capacity changing device being a rotationally movable swash plate, further comprising:

a connection member interposed between said movable swash plate and said driving part of said hydraulic actuator, wherein said connection member alters the reciprocal movement of said driving part of said hydraulic actuator into the rotational movement of said movable swash plate.

5. The axle driving apparatus as set forth in claim 4, further comprising:

a center section fixed to said housing, said center section formed therein with a closed fluid circuit through which said hydraulic pump and said hydraulic motor are fluidly connected with each other, wherein said driving part of said hydraulic actuator is incorporated in said center section while said center section serves as said fixed part of said hydraulic actuator.

6. An axle driving apparatus comprising:

a common housing;

a hydraulic pump receiving power from a prime mover, said hydraulic pump being contained in said housing;

a hydraulic motor fluidly connected with said hydraulic pump, said hydraulic motor being contained in said housing, wherein at least one of said hydraulic pump and said hydraulic motor is variable in displacement;

a capacity changing device for changing the capacity of said at least one of said hydraulic pump and said hydraulic motor;

an axle driven by said hydraulic motor, said axle being contained in said housing;

a hydraulic actuator contained in said housing for operating said capacity changing device, said hydraulic actuator having a driving part and a fixed part, said fixed part being fixed to said housing, said driving part being operatively connected to said capacity changing device;

a control valve contained in said housing for hydraulically controlling said hydraulic actuator; and

a link mechanism supported by said housing for operating said control valve, said link mechanism being operatively connected to a traveling control member provided on a vehicle.

7. An axle driving apparatus comprising:

a common housing;

a hydraulic pump receiving power from a prime mover, said hydraulic pump being contained in said housing;

a hydraulic motor fluidly connected with said hydraulic pump, said hydraulic motor being contained in said housing, wherein at least one of said hydraulic pump and said hydraulic motor is variable in displacement;

a capacity changing device for changing the capacity of said at least one of said hydraulic pump and said hydraulic motor;

an axle driven by said hydraulic motor, said axle being contained in said housing;

a hydraulic actuator contained in said housing for operating said capacity changing device, said hydraulic actuator having a driving part and a fixed part, said fixed part being fixed to said housing, said driving part being operatively connected to said capacity changing device;

a control valve contained in said housing for hydraulically controlling said hydraulic actuator; and

a link mechanism supported by said housing for operating said control valve, said link mechanism being operatively connected to a traveling control member provided on a vehicle, wherein said link mechanism is contained in said housing while a part of said link mechanism is extended outward from said housing so as to be operatively connected to said traveling control member.

8. An axle driving apparatus comprising:
  - a common housing;
  - a hydraulic pump receiving power from a prime mover, said hydraulic pump being contained in said housing;
  - a hydraulic motor fluidly connected with said hydraulic pump, said hydraulic motor being contained in said housing, wherein at least one of said hydraulic pump and said hydraulic motor is variable in displacement;
  - a capacity changing device for changing the capacity of said at least one of said hydraulic pump and said hydraulic motor;
  - an axle driven by said hydraulic motor, said axle being contained in said housing;
  - a hydraulic actuator for operating said capacity changing device, said hydraulic actuator having a driving part and a fixed part, said fixed part being fixed to said housing, said driving part being operatively connected to said capacity changing device;
  - a reciprocally movable control valve for hydraulically controlling said hydraulic actuator; and
  - a link mechanism supported by said housing for operating said control valve, said link mechanism being operatively connected to a traveling control member provided on a vehicle.
9. The axle driving apparatus as set forth in claim 8, said control valve is reciprocally movable in parallel driving part of said hydraulic actuator.
10. The axle driving apparatus as set forth in claim 8, mechanism comprising:
  - a rotary member rotatably supported by said housing, said rotary member being operatively connected to said traveling control member;
  - a link member interposed between said rotary member and said control valve, wherein said link member alters the rotational movement of said rotary member into the reciprocal movement of said control valve.

11. The axle driving apparatus as set forth in claim 10, wherein said driving part of said hydraulic actuator is connected to said link member for feed back thereof.

12. The axle driving apparatus as set forth in claim 11, wherein a portion of said link member between its connection portions with said rotary member and said control valve is provided for connection with said driving part of said hydraulic actuator.

13. The axle driving apparatus as set forth in claim 10, wherein said hydraulic actuator, said control valve, said rotary member and said link member are contained in said housing, and wherein said rotary member partly projects outwardly from said housing so as to be operatively connected to said traveling control member.

14. The axle driving apparatus as set forth in claim 10, further comprising:  
a neutral returning means provided on said rotary member, wherein said rotary member is biased to its neutral position by said neutral returning means for returning said capacity changing device.

15. An axle driving apparatus comprising:  
a common housing;  
a hydraulic pump receiving power from a prime mover, said hydraulic pump being contained in said housing;  
a hydraulic motor fluidly connected with said hydraulic pump, said hydraulic motor being contained in said housing, wherein at least one of said hydraulic pump and said hydraulic motor is variable in displacement;  
a capacity changing device for changing the capacity of said at least one of said hydraulic pump and said hydraulic motor;

an axle driven by said hydraulic motor, said axle being contained in said housing;

a hydraulic actuator for operating said capacity changing device, said hydraulic actuator having a driving part and a fixed part, said fixed part being fixed to said housing, said driving

part being operatively connected to said capacity changing device;  
a control valve for hydraulically controlling said hydraulic actuator;

a link mechanism supported by said housing for operating said control valve, said link mechanism being operatively connected to a traveling control member provided on a vehicle; and

a center section formed therein with a closed fluid circuit through which said hydraulic pump and said hydraulic motor are fluidly connected with each other, wherein said center section is fixed to said housing and serves as said fixed part of said hydraulic actuator.

16. The axle driving apparatus as set forth in claim 15, wherein said center section is contained in said housing.

17. The axle driving apparatus as set forth in claim 15, wherein said control valve is incorporated in said center section.

18. The axle driving apparatus as set forth in claim 17, wherein said control valve is reciprocally movable in parallel to said driving part of said hydraulic actuator.

19. The axle driving apparatus as set forth in claim 17, wherein said center section is contained in said housing.

20. An axle driving apparatus comprising:  
a common housing;

a hydraulic pump receiving power from a Prime mover, said hydraulic pump being contained in said housing;

a hydraulic motor fluidly connected with said hydraulic pump, said hydraulic motor being contained in said housing, wherein at least one of said hydraulic pump and said hydraulic motor is variable in displacement;

a capacity changing device for changing the capacity of said at least one of said hydraulic pump and said hydraulic motor; an axle driven by said hydraulic motor, said axle being contained in said housing;

a hydraulic actuator for operating said capacity changing device, said hydraulic actuator having a driving part and a fixed part, said fixed part being fixed to said housing, said driving part being operatively connected to said capacity changing device;

a control valve for hydraulically controlling said hydraulic actuator;

a link mechanism supported by said housing for operating said control valve, said link mechanism being operatively connected to a traveling control member provided on a vehicle; and

a center section formed therein with a closed fluid circuit through which said hydraulic pump and said hydraulic motor are fluidly connected with each other, wherein said control valve is incorporated in said center section.

21. The axle driving apparatus as set forth in claim 20, wherein said center section is contained in said housing.

22. An axle driving apparatus comprising:

a common housing;

a hydraulic pump receiving power from a prime mover, said hydraulic pump being contained in said housing;

a hydraulic motor fluidly connected with said hydraulic pump, said hydraulic motor being contained in said housing, wherein at least one of said hydraulic pump and said hydraulic motor is variable in displacement;

a capacity changing device for changing the capacity of said at least one of said hydraulic pump and said hydraulic motor:

an axle driven by said hydraulic motor, said axle being contained in said housing;

a hydraulic actuator for operating said capacity changing device, said hydraulic actuator having a driving part and a fixed part, said fixed part being fixed to said housing, said driving part being operatively connected to said capacity changing device;

a control valve for hydraulically controlling said hydraulic actuator, wherein said hydraulic actuator is supplied through said control valve with oil filled in said housing; and

a link mechanism supported by said housing for operating said control valve, said link mechanism being operatively connected to a traveling control member provided on a vehicle.

23. An axle driving apparatus comprising: a common housing;

a hydraulic pump receiving power from a prime mover, said hydraulic pump being contained in said housing;

a hydraulic motor fluidly connected with said hydraulic pump, said hydraulic motor being contained in said housing, wherein at least one of said hydraulic pump and said hydraulic motor is variable in displacement;

a capacity changing device for changing the capacity of said at least one of said hydraulic pump and said hydraulic motor;

an axle driven by said hydraulic motor, said axle being contained in said housing;

a hydraulic actuator for operating said capacity changing device, said hydraulic actuator having a driving part and a fixed part, said fixed part being fixed to said housing, said driving part being operatively connected to said capacity changing device;



a control valve for hydraulically controlling said hydraulic actuator, wherein said hydraulic actuator is supplied through said

control valve with oil filled in said housing:

a link mechanism supported by said housing for operating said control valve, said link mechanism being operatively connected to a traveling control member provided on a vehicle; and

a charge pump for supplying oil filled in said housing to a hydraulic circuit between said hydraulic pump and said hydraulic motor, said hydraulic actuator is supplied with oil from said charge pump.

24. An axle driving apparatus, comprising:

a common housing serving as a fluid sump;

a variable displacement hydraulic pump disposed in said housing, said hydraulic pump having a movable swash plate;

a hydraulic actuator for tilt-operating said movable swash plate;

a hydraulic motor disposed in said housing;

a center section disposed in said housing, said center section provided therein with a closed fluid circuit through which said hydraulic pump and motor are mutually connected; and

an axle disposed in said housing and driven by said hydraulic motor.

25. The axle driving apparatus as set forth in claim 24, further comprising

a charge pump disposed in said housing and driven together with said hydraulic pump so as to supply said hydraulic actuator with fluid from said fluid sump.

26. The axle driving apparatus as set forth in claim 24, said hydraulic actuator comprising:

a manually controlled control valve; and

a hydraulic piston combined with said control valve so as to be controlled in location by said control valve.

27. The axle driving apparatus as set forth in claim 26, wherein at least one of said hydraulic piston and said control valve is made integrally with said housing.

28. The axle driving apparatus as set forth in claim 27, said hydraulic piston or said control valve, which is made integrally with said housing, is disposed in said housing.

29. The axle driving apparatus as set forth in claim 27, wherein both said hydraulic piston and said control valve are made integrally with said housing.

30. The axle driving apparatus as set forth in claim 29, said hydraulic piston or said control valve, which is made integrally with said housing, is disposed in said housing.